

CARIBBEAN-ATLANTIC EXCHANGE THROUGH MONA PASSAGE

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LONG-TERM GOAL

Our long-term goal is to characterize and understand the physical oceanographic and atmospheric processes that determine the structure, circulation and variability of the northeastern Caribbean Sea and of the adjacent western tropical Atlantic.

SCIENTIFIC OBJECTIVES

The main scientific objective in this project is to accurately measure the exchange of North Atlantic and Caribbean Sea waters through Mona Passage and to determine the mean transport and flow variability at time scales from hourly to interannual.

APPROACH

Two acoustic Doppler current profiler (ADCP; RDI 75Khz) moorings are currently deployed along the ridge that runs from the western end of Puerto Rico up to the northeastern end of the Dominican Republic (Figure 1). This ridge has a sill depth varying between 400 and 500 meters in depth for a distance of approximately 65 km. The ADCP's are configured to sample the full water column, except very near the surface and bottom, with a 10m resolution. A third mooring, containing a single S4 (Inter-Ocean, Inc.) current meter is deployed close to the shallower shelf to the east. The monitoring period will extend for 1.5 years. This will allow us to resolve up to seasonal and interannual time scales in the transports. CTD stations across Mona Passage are occupied during the service cruises.

WORK COMPLETED

The “real” project start date for us was September 30, 1996 (not June 1996) as this was the date when project funds were finally available for spending. Since then we have purchased all major equipment and materials, tested every component in the lab and at sea and recently started the operational deployment of the instruments. The ADCP1 mooring was deployed on September 3 at 18°17.390'N, 67°48.033'W; ADCP2 was deployed on September 30 at 18°23.086'N, 68°04.340'W; the S4 was deployed on September 11 at 18°11.641'N, 67°29.397'W. We hope to retrieve the first three-month long records from the ADCPs in December. The S4 subsurface mooring released prematurely on October 10 and was promptly recovered thanks to the ARGOS monitoring of our moorings. We are redesigning the S4 mooring and it will be deployed again soon.

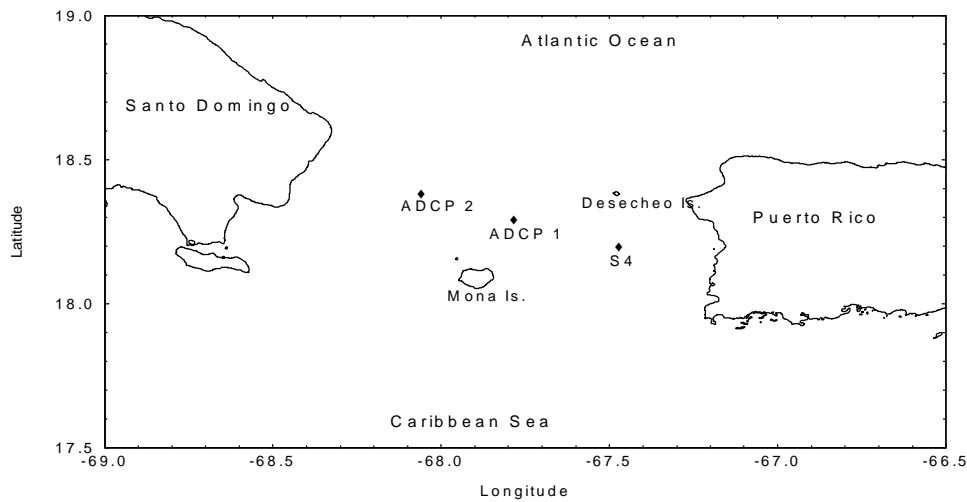


Figure 1. Site location map.

RESULTS

The only data we have at this moment comes from the S4 current meter. A 30-day record, September 11 to October 10, was recovered from the S4 when the mooring accidentally released (see above). The depth at the S4 mooring site is 265m and we wanted the S4 to sample near the core of the mixed-layer, at about 25-30m. Upon deployment, the S4 was located at a depth of 33m. This mooring is located about 20nm offshore from western PR, close to Los Placeres bank (Fig. 1).

Figures 2a,b,c show the u , v , and current rose plots for this time series. The mean speed was 28 cm/s, while the mean velocity was 9.2 cm/s towards 35° true. Figures 2a and 2b clearly show the predominant effect of the semidiurnal tide and maximum current speeds in the order of 70 cm/s. The tidal ellipse rotates in a clockwise sense (not shown).

TRANSITIONS

Arrangements have been made with Michael Crane of the National Oceanographic Data Center (NODC) for the ADCP data to be processed and published by NODC. There is great interest in our data by the US WOCE community as our sampling period coincides with WOCE field sampling in the North Atlantic.

RELATED PROJECTS

- 1) The Mayagüez Bay Marine Ecosystem: assesment of community responses to a water quality restoration initiative, Environmental Protection Agency - Mayagez Wastewater Treatment Company, four years, with Dr. Jorge R. García and Dr. Roy Armstrong.

As part of this project we have two current meters (AANDERAA RCM9s) in Mayagüez Bay, at the eastern boundary of Mona Passage. This makes for a total of five current meter moorings off western PR and Mona Passage. We seek to establish the

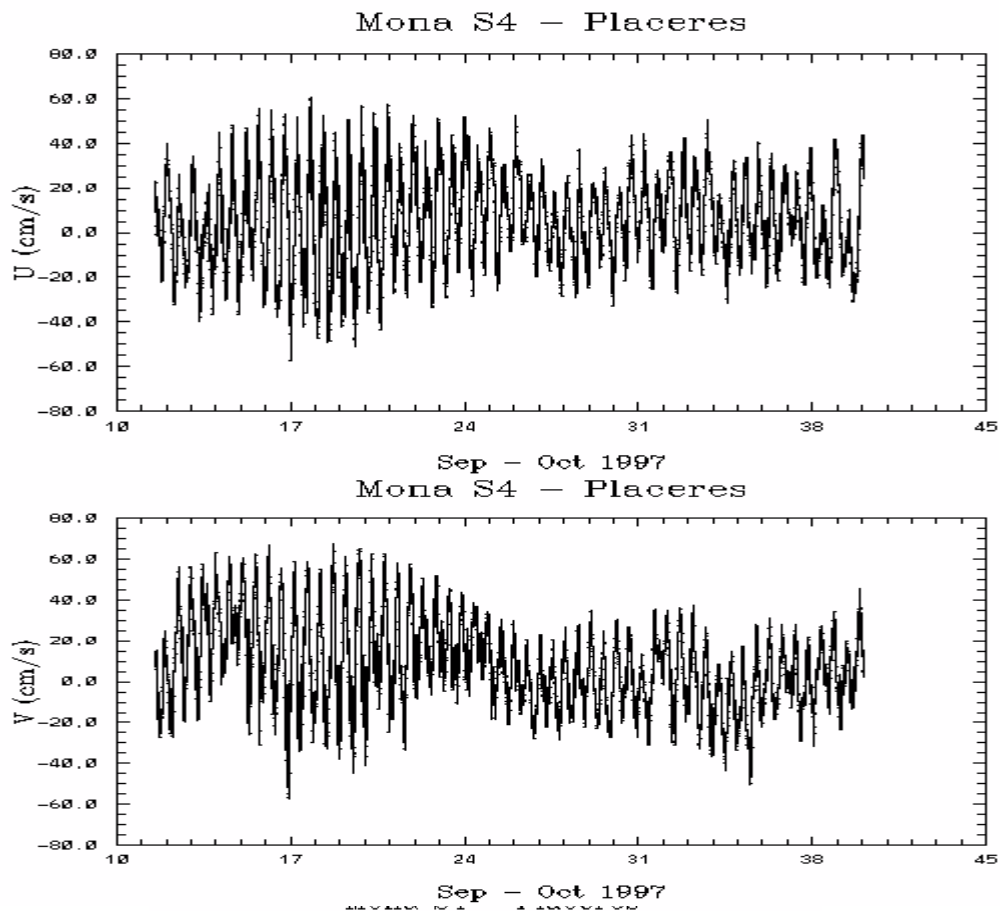


Figure 2. S4
u, b) v, c)

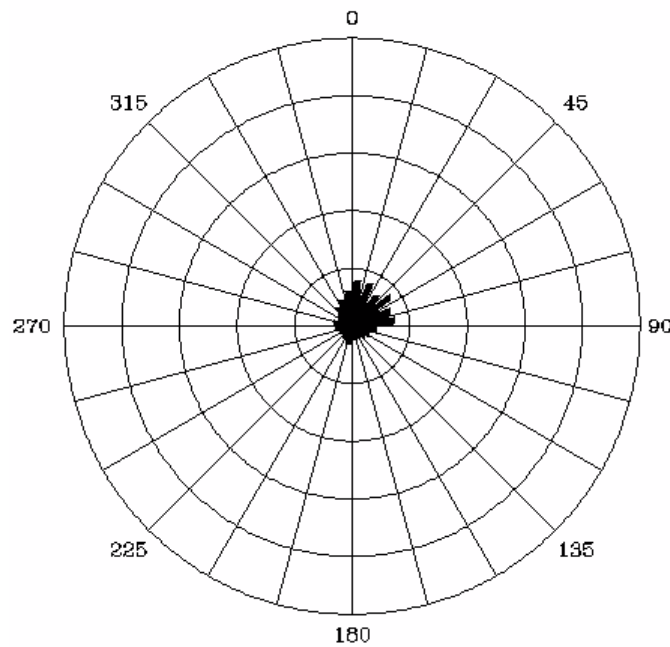
relationship
flows in
nearshore,
Mayagüez.

2)

Center for
Science -

Component,
NCCW-56,
Mercado.

In this



current meter data: a)
current transport rose

between offshore
Mona Passage and
shelf currents off

Development of a
Tropical Atmospheric
Physical
Oceanography
NASA, NASA
with Prof. Aurelio

project we are looking

at Atlantic-Caribbean gradients in the fluxes of climate-active gasses.

REFERENCES

A web site for this project is under construction.

